

# THE MINERAL INDUSTRIES OF BURUNDI, COMOROS, MALAWI, MAURITIUS, REUNION, RWANDA, AND SEYCHELLES

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## BURUNDI

Burundi, which is a small country in central Africa, was a producer of columbium (niobium) and tantalum ore, gold, and tin ore, most of which was designated for export in 2003 (table 1). The country also produced kaolin, limestone, peat, and sand and gravel for domestic consumption. Additionally, Burundi has resources of cobalt, copper, feldspar, nickel, phosphate rock, platinum-group metals (PGM), quartzite, rare-earth elements (REE), tungsten, uranium, and vanadium.

In 2003, Burundi's gross domestic product (GDP) amounted to about \$4.7 billion at purchasing power parity. The GDP fell by 0.5% in 2003 after rising by 4.5% in 2002 and 2.2% in 2001. In 2002, manufacturing accounted for 8% of the GDP; construction, 4%; and mining and energy, about 1% (International Monetary Fund, 2004b, p. 40; 2004c, p. 206; 2004§<sup>1</sup>).

Since 1993, civil unrest has led to economic stagnation and prevented development of the proposed Musongati nickel resource project. On October 8, 2003, the Government and the largest rebel group signed a power sharing agreement; the Parliament of Burundi approved the agreement on October 24th (United Nations Integrated Regional Information Networks, 2003; Argosy Minerals Ltd., 2004; International Monetary Fund, 2004c, p. 206).

## Commodity Review

### *Metals*

**Cobalt, Copper, Nickel, and Platinum-Group Metals.**—In 2003, Argosy Minerals Ltd. maintained its force majeure on its operations in Burundi. Argosy held exploration licenses for the Musongati, Nyabikere, and Waga nickel laterite deposits. Equus Ltd. of Australia and Burundi Trade Promotions signed a joint-venture agreement with Mineral Search of Africa (CI) Ltd (MSA) to explore for cobalt, copper, nickel, and PGM at Buhoro, Bukirasazi, and Rutovu (African Mining, 2004; Argosy Minerals Ltd., 2004).

**Columbium (Niobium), Tantalum, Tin, and Tungsten.**—In the northern Provinces of Kayanza and Kirundo, Comptoirs Miniers de Burundi S.A. (COMEBU) mined deposits of columbium (niobium), tantalum, tin, and tungsten. Production of columbite-tantalite fell to 24,382 kilograms (kg) in 2003 from 72,441 kg in 2002; the decline may have been the result of lower prices for tantalum. The value of output amounted to \$350,000 in 2003 (Mathias Sebahene, Burundi Ministry of Energy and Mines, written commun., July 26, 2004).

Tungsten mining resumed for the first time since 1997; the tungsten content of wolframite concentrates amounted to 26 metric tons (t) in 2003. Tin production, which had been shut down in 2002, was 7 t. Tin and tungsten accounted for less than 1% of the value of Burundi's mineral production (Mathias Sebahene, Burundi Ministry of Energy and Mines, written commun., July 26, 2004).

**Gold.**—Artisanal miners produced gold from alluvial deposits. The Burundi Mining Corp. (BUMINCO) held an exclusive gold exploration/mining permit for the entire Province of Muyinga. The Government planned to increase gold production in its national mining promotion program. In 2003, gold production rose to 2,855 kg from 483 kg; the value of gold production amounted to \$33.3 million (International Monetary Fund, 2004a, p. 48-49; Mathias Sebahene, Burundi Ministry of Energy and Mines, written commun., July 26, 2004).

### *Industrial Minerals*

**Cement and Stone, Crushed.**—The International Cement Review (2003) estimated that Burundi's cement consumption increased to 50,000 t in 2002 from 40,000 t in 2001. All local cement demand was met through imports from Tanzania, Uganda, and Zambia. The Government's national mining promotion program proposed limestone production for use in fertilizers and cement (International Monetary Fund, 2004a, p. 48).

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<sup>1</sup> References that include a section mark (§) are found in the Internet References Cited sections.

## **Mineral Fuels**

**Peat.**—The state-owned Office National de la Tourbe was responsible for the production and distribution of peat. In 2003, the production of peat fell to 4,580 t from 6,977 t in 2002 and 6,816 t in 2001. Domestic resources of peat were estimated to be 36 million metric tons (Mt), most of which were located in the Akanyara Valley near Buyongwe (tables 1, 3).

**Petroleum.**—Burundi has no identified resources of coal, natural gas, or petroleum. The country does not have a refinery for petroleum products; all petroleum demand was met through imports. In 2002, Burundi's petroleum imports were valued at \$15.9 million, or 15% of total imports (International Monetary Fund, 2004b, p. 51).

## **Infrastructure**

The state-owned Regie de Production et Distribution d'Eau et d'Electricite was the only local electric utility. In 2002, Burundi's power production rose to 127.1 gigawatt hours (GWh) from 114.1 GWh in 2001; most power was generated from hydroelectric sources. In 2002, the consumption of electricity fell to 117.3 GWh from 122.2 GWh in 2001; industrial consumption rose to 49.9 GWh from 42.1 GWh (International Monetary Fund, 2004b, p. 50).

Burundi's transportation network comprised about 14,500 kilometers (km) of highways, of which slightly more than 1,000 km was paved. The major waterway was Lake Tanganyika, which had a port at Bujumbura.

## **Outlook**

Economic growth was expected to be 5.4% in 2004 and 5.7% in 2005 (International Monetary Fund, 2004c, p. 206). Strong GDP growth in 2004 and 2005 may lead to increased demand for such local construction materials as gravel, limestone, and sand. The environmental problems of deforestation may lead to increased demand for peat for use as fuel and in the development of domestic phosphate rock resources to raise agricultural productivity.

The outlook for gold, columbium (niobium), tantalum, and tin depends heavily upon the resolution of political instability and the global market; Burundi's domestic market is limited by severe poverty. The development of the Musongati nickel project and deposits of REE and vanadium relied on the same factors. At the end of 2003, civil unrest continued, but was confined to the southwestern part of the country (Argosy Minerals, 2004).

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## **COMOROS**

The Federal Islamic Republic of the Comoros is located on three main islands in the Mozambique Channel about two-thirds of the way between northern Madagascar and northern Mozambique. In 2003, the mineral industry of Comoros continued to be limited to the production of such construction materials as clay, sand and gravel, and crushed stone for local consumption. The demand for cement, steel, and petroleum products was met through imports.

In 2003, the GDP of Comoros amounted to about \$1 billion at purchasing power parity. The GDP increased by 2.1% in 2003 after rising by 2.3% in 2002. In 2001, construction and public works accounted for about 6% of the GDP; manufacturing, 4%; and electricity, gas, and water, 2% (International Monetary Fund, 2004a, p. 3; 2004b, p. 206; 2004§).

Civil unrest has weakened the economy of Comoros in recent years. In December 2003, Comoran political leaders signed an agreement that settled disputes between the national and island governments (United Nations Integrated Regional Information Networks, 2003, 2004).

In 2001 (the latest year for which data were available), imports of iron and steel were 2,481 t compared with 2,234 t in 2000 and 3,299 t in 1996. The value of iron and steel imports amounted to about \$1.3 million in 2001, or nearly 3% of total imports (International Monetary Fund, 2004a, p. 34).

Imports of cement rose to 40,000 t in 2001 from 36,015 t in 2000 and 24,088 t in 1996. The value of cement imports amounted to about \$2.6 million in 2001, or 5% of total imports. The International Cement Review (2003) forecasted that cement consumption would rise to 50,000 t in 2003 from 45,000 t in 2002 (International Monetary Fund, 2004a, p. 34).

In 2001, Comoros operated powerplants that had a total capacity of 12.7 MW. The production of electricity was 32 GWh in 2001 compared with 35 GWh in 2000 and 30.9 GWh in 1996. From 1996 to 2001, national consumption of electricity rose to 30 GWh from 21.4 GWh. The Arab League loaned Comoros \$2.2 million to rehabilitate its power grid. Fossil fuels provided most of the country's power; geothermal energy resources were known to occur within the territory, but were not developed. Imports of petroleum products amounted to 45,103 t at a value of \$10 million in 2001, or 19% of total imports (Africa Energy Intelligence, 2003; International Monetary Fund, 2004a, p. 13, 34).

The outlook on minerals output was not expected to change significantly because Comoros has very limited mineral resources and weak infrastructure (United Nations Integrated Regional Information Networks, 2003). Import dependence and deforestation may lead to development of the country's geothermal resources. The International Monetary Fund (2004b, p. 206) predicted that the GDP would increase by 1.8% in 2004 and 3.5% in 2005.

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## MALAWI

Malawi, which is a small country in southern Africa, was a producer of cement, coal, crushed stone, dolomite, gypsum, kaolin, lime, and limestone for domestic consumption (table 1). The country was known to produce and export dimension stone, gemstones, and vermiculite. Malawi had deposits of bauxite, columbium (niobium), granite, graphite, kyanite, monazite, phosphate rock, pyrite, silica sand, titanium, and uranium.

In 2003, Malawi's GDP amounted to about \$6.8 billion at purchasing power parity. The GDP rose by 4.4% in 2003 and 1% in 2002 after falling by 4.2% in 2001. Manufacturing accounted for 9.6% of the GDP; construction, 2.2%; electricity and water, 1.3%; and mining and quarrying, 1%. In 2003, the mining sector grew by 23.5%, and the construction sector, by 9.7% (International Monetary Fund, 2004, p. 206; 2004§; Reserve Bank of Malawi, 2004, p. 74).

## Commodity Review

### Metals

**Columbium (Niobium) and Tantalum.**—Maravi Mineral Development Ltd. (a locally owned company) explored for columbium (niobium) and tantalum. The company held exploration licenses for Chilwa Island and Thambani Mountain and a reconnaissance license for an area in the Mzimaba District. Maravi carried out a pitting and sampling program at Thambani Mountain (Malunga, 2003).

**Nickel and Platinum-Group Metals.**—Albidon Ltd. of Australia held exclusive prospecting licenses (EPL) at Katakwi and Linthipe; the company was awarded an EPL for Bimbili River in May 2003. In October, the company signed a joint-venture agreement with Western Mining Corporation (WMC) of Australia to explore at Bimbili River. Albidon and WMC planned to spend \$1.4 million on exploration at Bimbili River, Katakwi, and Linthipe over 2 years. Lisungwe Mineral Resources also explored for nickel and PGM (Albidon Ltd., 2003, p. 13, 45-54; Malunga, 2003).

**Titanium and Zirconium.**—Millennium Mining Ltd. held exclusive prospecting licenses for the Lake Chilwa, Makanjila, and Salima mineral sands, which had a combined resource of more than 2,500 Mt that contained 165 Mt ilmenite (table 3). Millennium was engaged in feasibility studies of the Makanjila and Salima projects; the company expected to start its feasibility study on the Lake Chilwa project by mid-2004 (Munthali, 2003b).

Depending on the results of its exploration work, Millennium planned to build a mine at Makanjila and a mineral separation plant (MSP) at Chipoka. The MSP would produce ilmenite concentrate, as well as rutile and zircon products for export. Millennium also explored the possibility of building a smelter to convert the separated ilmenite to titania slag.

Allied Procurement Agency and Mineral Sands Ltd. of South Africa held an exclusive prospecting license for mineral sands in the Chipoka area. By October 2003, the companies reached the bankable feasibility study stage and planned to engage in trial mining (Munthali, 2003b).

In the southern part of the country, Crown Minerals of Malawi held a license for the Tengani deposit, which had resources of 108 Mt at a grade of 11% ilmenite, 2% rutile, and 1% zircon (table 3). Rift Valley was reported to have a small-scale zircon project. Maravi Mineral Development Ltd. explored for zircon at Thambani (Malunga, 2003).

### ***Industrial Minerals***

**Cement.**—Portland Cement Co. Ltd. and Shayona Cement Corp. operated cement plants in Blantyre and Livwezi, respectively. After the closure of its limestone quarry in 2002, Portland Cement began to import clinker from Zambia and Zimbabwe. Portland Cement was engaged in an upgrade to its bagging and milling facilities that it expected to complete in November 2003 (Mzembe, 2003).

In 2003, Malawi experienced shortages of cement because of rising demand, heavy floods that washed away the railroad from Blantyre to Lilongwe in 2002, and the Government's ban on cement imports. Portland Cement held an 85% share of the domestic cement market and Shayona Cement, 10% (Maeresa, 2003; Mzembe, 2003).

**Gemstones.**—Artisanal miners produced precious, semiprecious, and ornamental stones. The Government was engaged in a program to promote the domestic gemstone cutting and polishing industry. Maravi Mineral Development Ltd. explored for gemstones at Mzimba. Robin Mines and Sunstone Ltd. also explored for gemstones (Malunga, 2003; Munthali, 2003b).

**Gypsum.**—In 2003, the Government announced plans to build a chalk factory at Mponela in the Dowa District using funds from the Highly Indebted Poor Countries initiative. The factory would use local resources of gypsum as raw material; small amounts of gypsum have been produced at Livumbo in the Doma District since 2001 (Munthali, 2003a).

**Lime.**—National lime production fell sharply in 2001 and 2002 (table 1) because of a scarcity of fuel wood. The Government was engaged in a program that would assist small-scale miners to produce lime using coal. This program could alleviate Malawi's deforestation; artisanal miners often burned 3 t to 4 t of hardwood to produce 1 t of lime (Malunga, 2003; Tassell, 2002).

**Rare Earths and Strontium.**—In 2003, the European Investment Bank loaned Rift Valley Resource Developments \$315,000 for a feasibility study on mining monazite and strontianite at Kangankunde. Rift Valley planned a multi-stage production process. In the first stage, 20,000 metric tons per year (t/yr) of strontium carbonate concentrate would be produced; in the second stage, 6,000 t/yr of mixed rare-earth chloride; and in the third stage, cerium oxide and cerium carbonate. Rift Valley also planned to separate and refine lanthanum oxide and other rare earths from the third stage tailings (European Investment Bank, 2004; Saner, 2002).

**Stone, Dimension.**—Ilomba Granite of Blantyre operated a sodalite-syenite dimension stone quarry at Ilomba Hill in the Chitipa District. Granites Ltd. operated a granite quarry and explored for blue granite in the Rumphi District. Ilomba Granite and Granites Ltd. exported their products to Italy. Rival Building Contractors mined and explored for marble at Phalula in the Balaka District (Malunga, 2003; Munthali, 2003b).

### ***Mineral Fuels***

**Coal.**—Mulanje Minerals Ltd. (a subsidiary of Malawi Minerals Ltd. produced lignite coal at the Mwabvi Mine. At the Mchenga Mine, Coal Products Ltd. produced bituminous coal for domestic consumption and export to Tanzania. In March 2003, floods damaged mining equipment at Mchenga and reduced production by two-thirds. The floods also temporarily halted exports to Tanzania. Malawi was a net importer of coal in 2003; imports amounted to 12,200 t at a value of \$840,000 (Economist Intelligence Unit, 2003, p. 29; National Statistical Office of Malawi, 2004b§, c§).

**Petroleum.**—Malawi has no identified resources of natural gas or petroleum. The country did not have production facilities for petroleum products; all petroleum demand was met through imports. In 2002, Malawi's imports of petroleum products amounted to 1.21 million barrels at a value of \$60.9 million (National Statistical Office of Malawi, 2004§b, §c).

**Uranium.**—In 2003, Paladin Resources Ltd. of Australia announced that the Kayerekera uranium project was on hold pending the evaluation of the company's Langer Heinrich uranium project in Namibia. Paladin planned to produce 1,000 t/yr of uranium oxide at Kayerekera; the life of the mine was expected to be 10 years (Paladin Resources Ltd., 2003, p. 3, 5).

### ***Infrastructure***

Electricity Supply Company of Malawi (ESCOM) was the country's only large-scale producer of electricity. ESCOM operated hydroelectric power stations with a combined capacity of 240 MW. In 2003, the production of electricity increased to 1,189 GWh from 1,156.4 GWh in 2002. Sales increased to 949 GWh in 2003 from 925 GWh in 2002. Domestic sales accounted for more than 99% of total sales; the remainder was exported to Mozambique and Zambia (Economist Intelligence Unit, 2003, p. 29; National Statistical Office of Malawi, 2004§a).

In March 2003, flooding damaged the Nkula hydroelectric plant; this reduced ESCOM's capacity to 140 MW. Power rationing was in effect through June. Many factories were forced to produce at about 50% of capacity during this period (Economist Intelligence Unit, 2003, p. 29).

Malawi had about 28,400 km of roads, of which approximately 5,300 km was paved; the rail network covered nearly 800 km. Railways were managed by Ferrocarriles de Mozambique/ Sociedade de Desenvolvimento do Corredor de Nacala, which was the Mozambican railway company. Waterways included Lake Malawi and the Shire River.

## Outlook

Because most output of Malawi's minerals industry was for local consumption in 2002, the short-term outlook for most currently produced minerals depends on the state of the domestic economy. The International Monetary Fund (2004, p. 206) predicted that Malawi's economy would grow by 2.1% in 2004 and by 4% in 2005.

The outlook for many of Malawi's undeveloped mineral commodities is tied to strong global demand, because severe poverty limits domestic markets for bauxite, columbium (niobium), REE, tantalum, titanium, and uranium. In 2003, the world market for titanium dioxide was in a state of excess supply. Demand for titanium dioxide was expected to increase by about 110,000 t/yr; the market was likely to be in balance by 2007. Global nuclear-generating capacity was expected to increase from 353 GW in 2001 to 392 GW in 2010 (Mining Review Africa, 2003; U.S. Energy Information Administration, 2004, p. 106).

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## MAURITIUS

The Republic of Mauritius is located about 1,000 km east of Madagascar. In 2003, Mauritius produced basalt construction stone, coral sand, lime from coral, semimanufactured steel, and solar-evaporated sea salt. Local companies also cut imported diamond.

In 2003, the GDP of Mauritius amounted to about \$13.7 billion at purchasing power parity; per capita GDP was about \$11,300. The GDP increased by 2.7% in 2003 after rising by 4.3% in 2002, and 7.6% in 2001. Manufacturing accounted for 18.7% of the GDP; construction, 5.3%; electricity, gas, and water, 2.2%; and mining and quarrying, less than 1% (International Monetary Fund, 2004, p. 206; 2004§; Mauritius Central Statistics Office, 2004c, p. 30).

Domestic rolling mills produced steel-reinforcing bars (rebar) and welded mesh using imported ingot as raw material. In 2003, the production of iron bars and steel tubes rose to 58,700 t from 52,400 t in 2002. Imports of iron and steel amounted to 123,000 t at a value of \$53.3 million in 2003, or about 2% of total imports (Mauritius Central Statistics Office, 2004b, p. 21, 24; M.V.D. Domun, Ministry of Agriculture, Food Technology, and Natural Resources, written commun., August 9, 2004).

United Basalt Products (UBP) was the largest supplier of building products in Mauritius. UBP produced aggregates at nine locations on the island of Mauritius. At Le Mecque, the company produced 660,000 t/yr of aggregate from crushed basalt. On the island of Rodrigues, Welcome Industries Ltd. (a subsidiary of UBP) had a production capacity of nearly 150,000 t/yr of aggregates. Gamma Civic Ltd. also produced aggregates.

Mauritius did not produce cement in 2003; all the country's cement was imported, mainly from Asian or Middle Eastern countries. In 2003, imports of cement amounted to 648,000 t at a value of \$24.9 million, or about 1% of total imports (Mauritius Central Statistics Office, 2004b, p. 21, 24).

Mauritius Chemical and Fertilizer Industry Ltd. was the country's only producer of fertilizers. In 2003, fertilizer production rose to 87,300 t from 86,100 t in 2002. In 2003, imports of fertilizers amounted to 64,000 t at a value of \$10.6 million (Mauritius Central Statistics Office, 2004b, p. 24; M.V.D. Domun, Ministry of Agriculture, Food Technology, and Natural Resources, written commun., August 9, 2004).

Mauritius had no identified resources of fossil fuels. In 2003, imports of coal were 289,400 t compared with 312,000 t in 2002. Gamma Civic Ltd. operated an asphalt plant; the demand for all other petroleum products was met through imports. The value of imported mineral fuels, lubricants, and related products amounted to \$243 million in 2003, or nearly 11% of total imports (Mauritius Central Statistics Office, 2004a, p. 11; 2004b, p. 21-22).

In 2003, Mauritius had powerplants with an effective capacity of 568.3 GW. National production of electricity rose to 2,058.2 GWh in 2003 from 1,948.1 GWh in 2002. Diesel and fuel oil accounted for 48.8% of electricity generated; coal, 22.7%; bagasse, 21.3%, hydroelectric plants, 5.7%; and kerosene, 1.5%. The state-owned Central Electricity Board (CEB) produced 1,134.9 GWh in 2003. Independent power producers generated 923.2 GWh at bagasse- and coal-fired plants, of which 729.5 GWh was sold to CEB (Mauritius Central Statistics Office, 2004a, p. 12).

Peak demand for electricity increased to 323.8 GW of capacity in 2003 from 308.6 GW in 2002. Domestic consumption of electricity rose to 1,626.9 GWh from 1,948.9 GWh. Residential consumers accounted for 564.6 GWh; industrial, 552 GWh; commercial, 479.3 GWh; and others, 31 GWh (Mauritius Central Statistics Office, 2004a, p. 12-13; 2004c, p. 27).

The economy of Mauritius is likely to continue to grow steadily in the near future. The International Monetary Fund (2004, p. 206) predicted that the GDP would increase by 4.4% in 2004 and by 4.8% in 2005. In the short run, the growth in the minerals sector is likely to be restricted to construction materials. Cement consumption was expected to rise by 4% to 6% per year from 2003 to 2007 (International Cement Review, 2003). Offshore oil exploration has been inconclusive, and polymetallic nodules on the ocean floor are unlikely to be developed in the foreseeable future.

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## REUNION

Reunion, which is an overseas department of France, is located about 650 km east of Madagascar. Production of mineral commodities represented only a small part of the economy of Reunion, although little quantitative information was available.

Reunion has no identified resources of coal or petroleum; all petroleum demand was met through imports. Holcim (Réunion) S.A. produced 380,000 t/yr of hydraulic cement by grinding imported clinker; its plant at Le Port had a capacity of 400,000 t/yr. The company also produced 1.3 million metric tons per year of aggregates from plants at Bras Panon, Sainte-Clotilde, Saint-Joseph, and Saint-Pierre [Holcim (Réunion) S.A., 2003]. Additionally, seacoast coral continued to meet local construction needs. Little change in future mineral activity is anticipated.

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## RWANDA

Rwanda's mineral industry produced gold ores and concentrates of columbium (niobium), tantalum, tin, and tungsten, most of which was designated for export. This small country in central Africa also produced cement, sapphire, and small quantities of natural gas (table 1). Rwanda was also known to have deposits of beryllium, kaolin, and peat.

In 2003, Rwanda's GDP amounted to about \$10.6 billion at purchasing power parity. The GDP grew by 0.9% in 2003 after rising by 9.4% in 2002, and 6.7% in 2001. In 2002, manufacturing accounted for 9.5% of the GDP; construction, 8.1%; and mining and quarrying, less than 1% (Banque Nationale du Rwanda, 2003, p. 110; International Monetary Fund, 2004, p. 206; 2004\$).

In 2003, the value of production in the mining and quarrying sector fell sharply because of lower prices for columbite-tantalite. From 1998 to 2003, mineral exports accounted for 38% of the increase in Rwanda's total exports. The construction sector grew in 2003 because of Government support for hotel construction projects. The electricity, gas, and water sector also grew (Banque Nationale du Rwanda, 2004b; Economist Intelligence Unit, 2004, p. 19-20).

In October 2003, the Government of Rwanda announced that it would investigate allegations of illegal exploitation of natural resources in Congo (Kinshasa) by Rwandans. The allegations were raised in a report issued in 2002 by a United Nations panel of experts (United Nations Integrated Regional Information Networks, 2003; United Nations Security Council, 2002).

## Commodity Review

### *Metals*

**Columbium (Niobium) and Tantalum.**—Coopérative de Promotion de l'Industrie Minière Artisanale, which was a group of many small miners' cooperatives, Metal Processing Association (MPA) of Rwanda, and Régie d'Exploitation et de Développement des Mines (REDEMI) produced ores of columbium (niobium) and tantalum. Columbite-tantalite was produced from numerous mines near Gikongoro, Kamonyi, Kayenzi, Kibongo, Shyorongi, and Taba. Concentrating facilities were located at Gatumba. REDEMI planned to produce 30 t of columbite-tantalite in 2004 compared with 12 t in 2000. The state-owned company planned to put its first concessions up for sale in 2007 (Africa Mining Intelligence, 2004).

In 2003, falling prices for columbite-tantalite caused many artisanal miners to cease production. Exports of columbite-tantalite concentrates were 732 t at a value of \$6.3 million. Columbite-tantalite accounted for 10% of total exports in 2003, compared with 21% in 2002 and 45% in 2001 (Banque Nationale du Rwanda, 2004b; Economist Intelligence Unit, 2004, p. 19).

**Gold.**—Deposits of gold occurred in southwestern Rwanda. Domestic production was about 10 kg per year in recent years. In 2003, gold exports amounted to 44 kg at a value of about \$450,000, or nearly 1% of total exports (Banque Nationale du Rwanda, 2004b).

**Tin.**—MPA operated a tin mine and smelter at Gisenyi; cassiterite was also mined at Gatumba and Shyorongi. REDEMI operated a cassiterite-processing facility at Rutongo; the company planned to produce 547 t of cassiterite in 2004 compared with 203 t in 2000. Rwanda's exports of cassiterite were 1,458 t at a value of about \$4.5 million, or 7% of total exports (Africa Mining Intelligence, 2004; Banque Nationale du Rwanda, 2004b).

**Tungsten.**—Wolframite was mined at Shyorongi; REDEMI planned to produce 234 t of wolframite in 2004 compared with 112 t in 2000. National exports of wolframite amounted to 120 t at a value of about \$220,000, which was less than 1% of total exports (Africa Mining Intelligence, 2004; Banque Nationale du Rwanda, 2004b).

### *Industrial Minerals*

**Cement.**—Cimenterie du Rwanda (Cimerwa) was Rwanda's only producer of cement; production increased to 100,568 t in 2002 from 91,204 t in 2001 and 60,505 t in 1997 because of higher domestic demand. The share of the construction industry in the GDP had risen to 8% in 2002 from 5% in 1995 because of the need to rebuild infrastructure damaged or destroyed in 1994 and to house former refugees returning from exile (Banque Nationale du Rwanda, 2003, p. 19-21).

In late 2002, local demand for cement was unusually high during Cimerwa's annual shutdown for plant maintenance. As a result, Rwanda experienced cement shortages in early 2003. During the first 9 months of 2003, Cimerwa provided 83% of domestic cement requirements, and imports provided 17%. Rwanda imported cement from other countries in the Common Market for Eastern and Southern Africa. Small amounts of cement were exported to Burundi and Congo (Kinshasa) (Ministere des Finances et de la Planification Economique, 2003, p. 15; Rwanda National Assembly, 2003§).

### *Mineral Fuels*

**Natural Gas.**—Rwanda had resources of natural gas under Lake Kivu. Natural gas production was 900,000 cubic meters in 2002 compared with 800,000 cubic meters in 2001 and 400,000 cubic meters in 1997 (table 1). The Israel Electricity Company signed a joint-venture agreement with the Government to build a gas-fired power station with a capacity of 25 MW; the company was seeking funding for its project. The Gisenyi Electric and Gas Company was building a power station that would eventually reach a capacity of 10 MW (Africa Energy Intelligence, 2003; Banque Nationale du Rwanda, 2003, p. 20).

**Petroleum.**—Rwanda had no identified resources of coal or petroleum. The country did not have production facilities for petroleum products; all petroleum demand was met through imports. In 2003, imports of energy products amounted to 98,436 t at a value of \$40.2 million; energy imports accounted for nearly 16% of Rwanda's total imports (Banque Nationale du Rwanda, 2004a).

### *Infrastructure*

In 2002, Rwanda's production of electricity was 98.2 GWh, compared with 89.3 GWh in 2001 and 110.8 GWh in 1997. The increase in production was the result of higher rainfall. From 1997 to 2002, imports increased to 136 GWh from 73.2 GWh. Hydroelectric sources provided most of Rwanda's electricity. The Government estimated the cost of new power stations to meet Rwanda's energy requirements to be \$400 million (Africa Energy Intelligence, 2003; Banque Nationale du Rwanda, 2003, p. 20).

Rwanda's transportation network comprised about 12,000 km of roads, of which 1,000 km was paved. Lake Kivu was navigable by shallow-draft barges and native craft. Transportation costs in this land-locked country were among the highest in Africa.

The International Monetary Fund (2004, p. 206) predicted that Rwanda's GDP would grow by 6% in 2004 and 6% in 2005; the improving economic situation may lead to increased consumption of construction materials. The severe environmental problems caused by deforestation may lead to the development of domestic peat and natural gas resources. The outlook for Rwanda's mineral industry depends on the resolution of political instability and favorable world market conditions for columbium (niobium), gold, tantalum, tin, and tungsten.

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## SEYCHELLES

The Republic of Seychelles is a group of 40 granitic and 50 or more coralline islands that is located northeast of Madagascar in the Indian Ocean. In 2003, the GDP of Seychelles amounted to about \$970 million at purchasing power parity. The GDP fell by 5.1% in 2003 after rising by 0.3% in 2002. In 2002, handicrafts, manufacturing, and mining accounted for 18% of the GDP; building and construction, 10%; and electricity and water, 2% (Central Bank of Seychelles, 2004, p. 75; International Monetary Fund, 2004, p. 206; 2004\$).

Mineral production in Seychelles consisted mostly of production of such construction materials as clay, coral, sand, and stone. Cement requirements were met from imports. Gondwana Granite Ltd. reported that its granite production fell to 768 t in 2003 from 864 t in 2002. In 2003, United Concrete Products (Seychelles) Ltd. produced 127,616 t of gravel and crushed rock compared with 147,331 t in 2002. Civil Construction Company Ltd. produced 85,310 t of gravel and crushed rock in 2003 compared with 92,415 t in 2002 (Cyril Hitie, Ministry of Economic Planning, written commun., September 3, 2004).

In 2002, imports of mineral fuels amounted to \$50.8 million, which was 14% of total imports. The production of electricity for 2003 was 242 GWh compared with 229 GWh in 2002 and 159 GWh in 1998 (Central Bank of Seychelles, 2004, p. 64, 76).

The International Monetary Fund (2004, p. 206) predicted that the GDP of Seychelles would decline by 2% in 2004 and rise by 1% in 2005. The short-term outlook for mineral production is for little change. Seychelles has modest natural resources, and any newly discovered resources of petroleum and natural gas could not be exploited immediately.

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TABLE 1

BURUNDI, MALAWI, MAURITIUS, REUNION, RWANDA, AND SEYCHELLES: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Country and commodity	1999	2000	2001	2002	2003 <sup>c</sup>
<b>BURUNDI</b>					
Clays, kaolin	1,597	1,500	--	-- <sup>e</sup>	--
Columbite-tantalum, mine output, ore (32% Ta <sub>2</sub> O <sub>5</sub> ):					
Gross weight kilograms	42,149	31,175	122,537	72,441	24,382 <sup>2</sup>
Ta <sub>2</sub> O <sub>5</sub> content do.	12,600	10,013	39,359	17,676	7,044 <sup>2</sup>
Gold, mine output, Au content do.	--	--	415	483	2,855 <sup>2</sup>
Lime	50 <sup>e</sup>	-- <sup>2</sup>	-- <sup>e</sup>	NA <sup>r</sup>	NA
Peat <sup>3</sup>	20,000	4,088	6,816 <sup>r</sup>	6,977	4,580 <sup>2</sup>
Tin, mine output, Sn content	18	8 <sup>r</sup>	4	--	7 <sup>2</sup>
Tungsten, mine output, W content	--	--	-- <sup>e</sup>	--	26 <sup>2</sup>
<b>MALAWI<sup>4</sup></b>					
Cement, hydraulic	186,500	155,920	180,761 <sup>r</sup>	174,283	190,000
Coal:					
Bituminous	43,800	34,250	34,410	41,867	14,000
Lignite	--	--	--	40,000 <sup>e</sup>	60,000
Dolomite	1,200 <sup>e</sup>	--	49 <sup>r</sup>	4,394	5,400
Gemstones kilograms	649	16,390	16,500 <sup>e</sup>	16,500 <sup>e</sup>	20,000
Kaolin	NA	719	825	636	800
Lime	2,900	21,886	3,580 <sup>r</sup>	1,241	1,500
Sodium silicate	803	1,538	--	--	--
Stone:					
Crushed for aggregate	111,095	80,780	594,979	155,731	193,000
Dimension, crude and partly worked	NA	78	483 <sup>r</sup>	130	160
Limestone, for cement <sup>e</sup>	171,900 <sup>2</sup>	144,000	167,000	175,000	35,000
Vermiculite	NA	--	1	1 <sup>r, e</sup>	1
<b>MAURITIUS<sup>5</sup></b>					
Fertilizers	80,895 <sup>r</sup>	83,673 <sup>r</sup>	84,278 <sup>r</sup>	86,100 <sup>r</sup>	87,300 <sup>2</sup>
Iron and steel, semimanufactures	42,700 <sup>r</sup>	46,000	48,700 <sup>r</sup>	52,400 <sup>r</sup>	58,700 <sup>2</sup>
Salt, sea	6,300 <sup>r</sup>	6,100 <sup>r</sup>	6,800 <sup>r</sup>	7,000 <sup>r</sup>	7,200
Sand, coral <sup>c</sup>	450,000 <sup>2</sup>	400,000 <sup>2</sup>	410,000	-- <sup>r, e</sup>	--
<b>REUNION<sup>6</sup></b>					
Cement <sup>c</sup>	380,000 <sup>2</sup>	380,000 <sup>r</sup>	380,000 <sup>r</sup>	380,000 <sup>r</sup>	380,000
<b>RWANDA<sup>7</sup></b>					
Cement	66,291	70,716	91,204 <sup>r</sup>	100,568 <sup>r</sup>	105,000
Columbite-tantalite, ore and concentrate:					
Gross weight kilograms	147,000	561,000	241,000	96,000	65,000 <sup>2</sup>
Nb content do.	46,200	176,000	75,800	43,200	29,000
Ta content do.	31,000	118,000	50,900	24,000	16,000
Gold, mine output, Au content do.	10	10	10 <sup>e</sup>	10 <sup>e</sup>	10
Natural gas, gross thousand cubic meters	1,400 <sup>r</sup>	1,400 <sup>r</sup>	800 <sup>r</sup>	900 <sup>r</sup>	1,000
Tin, mine output, Sn content	248	276	169	197	427 <sup>2</sup>
Tungsten, mine output, W content	41	108	142	153	57 <sup>2</sup>
<b>SEYCHELLES</b>					
Dimension stone, granite	NA	54,788	6,044	864 <sup>r</sup>	768 <sup>2</sup>
Gravel and crushed rock	NA	81,400	96,819	239,746 <sup>r</sup>	212,926 <sup>2</sup>
Sand	NA	12,053	8,128	2,840 <sup>r</sup>	2,165 <sup>2</sup>

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits. <sup>r</sup>Revised. NA Not available. -- Zero.<sup>1</sup>Includes data available through September 29, 2004.<sup>2</sup>Reported figure.<sup>3</sup>Reported on the basis of fiscal year starting on May 1.<sup>4</sup>In addition to commodities listed, modest quantities of salt and unlisted varieties of crude construction materials (clays, sand and gravel, and other stone) may also be produced, but information is inadequate to make reliable estimates of output levels.<sup>5</sup>In addition to the commodities listed, asphalt, basalt, and lime are also known to be produced, but information is inadequate to make reliable estimates of output levels.<sup>6</sup>In addition to the commodity listed, coral and volcanic rock are also known to be produced, but information is inadequate to make reliable estimates of output levels.<sup>7</sup>In addition to the commodities listed, sapphire and pozzolanic materials are also known to be produced, but information is inadequate to make reliable estimates of output levels.

TABLE 2  
BURUNDI, MALAWI, MAURITIUS, REUNION, AND RWANDA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies	Location of main facilities	Annual capacity
<b>BURUNDI</b>			
Cement	Burundi Cement Plant <sup>1</sup>	Bujumbura	20,000.
Columbium (niobium) and tantalum	Comptoirs Miniers de Burundi S.A.	Kayanza and Kirundo Provinces	NA.
Gold	Burundi Mining Corp. <sup>2</sup>	Masaka	18,300 ore processing.
Do. kilograms	do.	do.	33 gold.
Peat	Office National de la Tourbe	Highland Bogs	20,000.
Tungsten	Comptoirs Miniers de Burundi S.A.	do.	25.
<b>MALAWI</b>			
Cement	Portland Cement Co. Ltd.	Blantyre	288,000.
Do.	do.	Changalume	180,000.
Do.	Shayona Cement Corp.	Livwezi	37,000.
<b>Coal:</b>			
Bituminous	Coal Products Ltd.	Mchenga	35,000. <sup>c</sup>
Lignite	Mulanje Minerals Ltd.	Mwabvi	60,000.
Dimension stone	Ilomba Granite of Blantyre	Ilomba Hill	NA.
Fertilizers	Optichem Ltd.	Blantyre	40,000.
Limestone	Portland Cement Co. <sup>3</sup>	Changalume	192,000. <sup>c</sup>
Do.	Shayona Cement Corp.	Kasungu Province	NA.
Vermiculite	Crown Minerals	Feremu	NA.
<b>MAURITIUS</b>			
Aggregates	United Basalt Products	La Mecque	660,000. <sup>c</sup>
Fertilizers	Mauritius Chemical and Fertilizer Industry Ltd.	Port Louis	100,000.
Steel	Consolidated Steel Ltd.	do.	85,000 rebar.
<b>REUNION</b>			
Cement	Ciments de Bourbon SA	Bourbon	400,000.
<b>RWANDA</b>			
Cement	Cimenterie du Rwanda	Cyangugu	115,000.
Columbium (niobium) and tantalum	Régie d'Exploitation et de Développement des Mines	Gikongoro, Kamonyi, Kayenzi, Kibongo, Shyorongi, and Taba	NA.
<b>Tin:</b>			
Mine	Metal Processing Association	Gisenyi	NA.
Refined	do.	do.	200.
Tungsten	Régie d'Exploitation et de Développement des Mines	Shyorongi	NA.

<sup>c</sup>Estimated. NA Not available.

<sup>1</sup>Has not operated since 1996.

<sup>2</sup>Not operational in 2003.

<sup>3</sup>Closed in late 2002.

TABLE 3  
BURUNDI, MALAWI, AND RWANDA: MINERAL RESOURCES IN 2003 <sup>1</sup>

Commodity	Deposit	Tonnage	Grade	Mineral content
<b>BURUNDI</b>				
Cobalt, copper, and nickel	Musongati	185 Mt	1.31% Ni; 0.08% Co; 0.17% Cu	2.4 Mt Ni; 150,000 t Co; 310,000 t Cu.
Do.	Nyabikere	46 Mt	1.45% Ni; 0.031% Co; 0.012% Cu	670,000 t Ni; 14,000 t Co; 5,500 t Cu.
Do.	Waga	35 Mt	1.38% Ni; 0.048% Co; 0.028% Cu	480,000 t Ni; 17,000 t Co; 9,800 t Cu.
Gold	Various deposits in Muyinga Province <sup>2</sup>	NA	NA	60 t.
Kaolin	Vyerwa	16 Mt	NA	NA.
Do.	Matongo	2.7 Mt	NA	NA.
Limestone	do.	1 Mt	NA	NA.
Peat	Akanyuru Valley	NA	NA	36 Mt.
<b>MALAWI</b>				
Bauxite	Mulanje Mountain	26 Mt	43.3% Al <sub>2</sub> O <sub>3</sub>	11 Mt Al <sub>2</sub> O <sub>3</sub> .
Coal	Ngaga	15 Mt	NA.	NA.
Do.	Mwabvi	4.7 Mt	NA.	NA.
Do.	Livingstonia (Mchenga Mine)	2 Mt	NA.	NA.
Columbium (niobium)	Tundulu	0.9 Mt	0.37% Nb <sub>2</sub> O <sub>5</sub>	3,300 t Nb <sub>2</sub> O <sub>5</sub> .
Do.	Chilwa Island	0.38 Mt	0.95% Nb <sub>2</sub> O <sub>5</sub>	3,600 t Nb <sub>2</sub> O <sub>5</sub> .
Do.	Ilomba Hill	0.1 Mt	3% Nb <sub>2</sub> O <sub>5</sub>	3,000 t Nb <sub>2</sub> O <sub>5</sub> .
Kaolin	Linthipe	14 Mt	33.8% Al <sub>2</sub> O <sub>3</sub>	
Limestone	Malowa Hill	4.1 Mt	52% CaO	
Marble	do.	3.7 Mt	36.21% CaO	
Phosphate rock	Tundulu	2 Mt	17% P <sub>2</sub> O <sub>5</sub>	340,000 t.
Pyrite	Chisepo	34 Mt	8% S	2.7 Mt.
Strontium and rare earths	Kangankunde	11 Mt	8% Sr; 2% REE	880,000 t Sr; 220,000 t REE.
Titanium	Makanjila	1000 Mt	5.2% ilmenite	52 Mt ilmenite
Do.	Lake Chilwa	1000 Mt	7.05% ilmenite; 0.11% rutile; 1.16% zircon	71 Mt ilmenite; 1.1 Mt rutile; 12 Mt zircon.
Do.	Salima	500 Mt	8.4% ilmenite; 0.38% rutile; 0.28% zircon	42 Mt ilmenite; 1.9 Mt rutile; 1.4 Mt zircon.
Do.	Tengani	108 Mt	11% ilmenite; 2% rutile; 1% zircon	12 Mt ilmenite; 2.2 Mt rutile; 1.1 Mt zircon.
Uranium	Kayelakera	7.7 Mt	0.15% U <sub>3</sub> O <sub>8</sub>	11,500 t U <sub>3</sub> O <sub>8</sub> .
Vermiculite	Mwanza District	2.5 Mt	10% vermiculite	250,000 t.
<b>RWANDA</b>				
Natural gas		57 billion cubic meters	NA	NA.

NA Not available.

<sup>1</sup>Abbreviations used in this table for commodities include the following: Al<sub>2</sub>O<sub>3</sub>--aluminum oxide; C--carbon; CaO--calcium oxide; Co--cobalt; Cu--copper; Nb<sub>2</sub>O<sub>5</sub>--columbium (niobium) oxide; Ni--nickel; P<sub>2</sub>O<sub>5</sub>--phosphorous pentoxide; REE--rare-earth elements; S--sulfur; SiO<sub>2</sub>--silicon dioxide; Sr--strontium; U<sub>3</sub>O<sub>8</sub>--uranium oxide; and V--vanadium. Abbreviations used in this table for units of measurement include the following: Mt--million metric tons; and t--metric tons.

<sup>2</sup>Includes Masaka, which has resources of 8 million metric tons at a grade of 1.8 grams per metric ton gold.

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